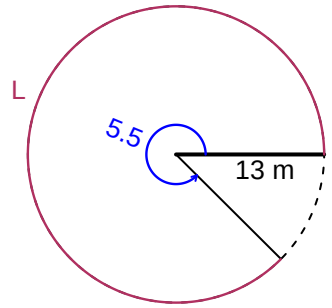
Name: Date:

Trig Final (Solution v34)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 5.5 radians. The radius is 13 meters. How long is the arc in meters?

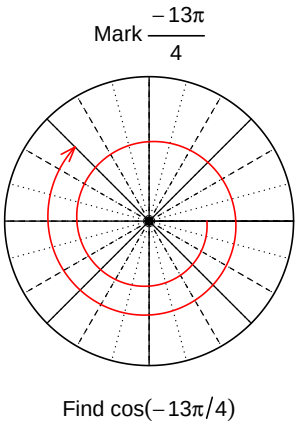


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

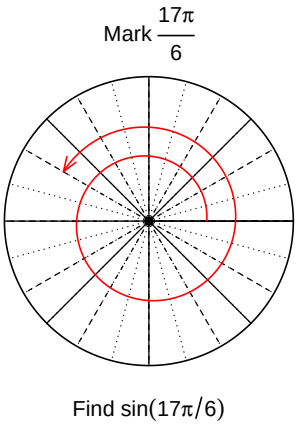
$L = 71.5$ meters.

Question 2

Consider angles $\frac{-13\pi}{4}$ and $\frac{17\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-13\pi}{4}\right)$ and $\sin\left(\frac{17\pi}{6}\right)$ by using a unit circle (provided separately).



Find $\cos(-13\pi/4)$



Find $\sin(17\pi/6)$

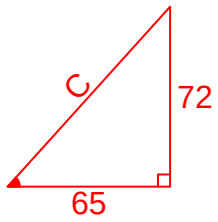
$\cos(-13\pi/4) = \frac{-\sqrt{2}}{2}$

$\sin(17\pi/6) = \frac{1}{2}$

Question 3

If $\tan(\theta) = \frac{-72}{65}$, and θ is in quadrant IV, determine an exact value for $\sin(\theta)$.

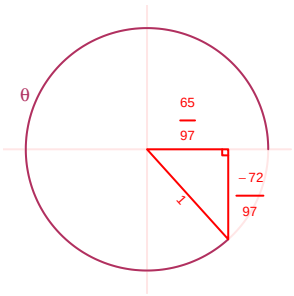
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$65^2 + 72^2 = C^2$$
$$C = \sqrt{65^2 + 72^2}$$
$$C = 97$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\sin(\theta) = \frac{-72}{97}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 5.45 meters, a frequency of 4.4 Hz, and a midline at $y = 8.2$ meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 5.45\sin(2\pi 4.4t) + 8.2$$

or

$$y = 5.45\sin(8.8\pi t) + 8.2$$

or

$$y = 5.45\sin(27.65t) + 8.2$$